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Compliant bearing plotting routines

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FILE..... 3641-12		PAGE..... OF.....
PREPARED BY..... CJDevenny		COPY NO. 18
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SUBJECT Compliant Bearing Plotting Routines

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ISSUED TO

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MECHANICAL ENGINEERING
LABORATORY MEMORANDUM

NO. NRC-ENG-108

PAGE 1 OF

SUBJECT

Three Fortran programs for plots relative to the compliant bearing problem.

- (i) NPLOT.S.NPLOT - plot of the 10 angular curves
- (ii) PIE.S.PIE - a 3-dimensional plot of the compliant surface.
- (iii) CALC.S.CALC - two 3-dimensional plots of:
 - (a) the pressure profile, and
 - (b) the compliant surface.

HOW TO RUN THE PROGRAMS

Note: Words in capital letters are commands to be typed exactly as written.

Step 1 Sign on to T.S.S. on the Decwriter III beside the HP7221 plotter in the Computation Centre.

Step 2 Turn on the plotter by pressing the "Line" button in. (I-on O-off). Press the "Chart Hold" button in.

Step 3 DDEF FT01F001,, POLAR2
(DDEF FT02F001,, PDAT)
- The second DDEF is necessary only for the CALC program.

Step 4 CLEAN
DISSPLA HP7221 (, FLIP)
CALL program name
- The Flip option is used for the CALC and the NPLOT programs.
- The program name is either NPLOT, PIE or CALC.

Step 5 There will be a prompt asking you to enter options.

- (a) press "chart load" button (a light will go on)
- (b) insert paper
- (c) press "chart hold" button and smooth paper
- (d) hit return

During the CALC program there will be a second prompt asking you to enter options. When the first plot is completed, hit return.

Step 6 The results are printed to the HP7221 plotter. Press "chart load", remove the paper and turn the plotter off by pressing the "Line" button.

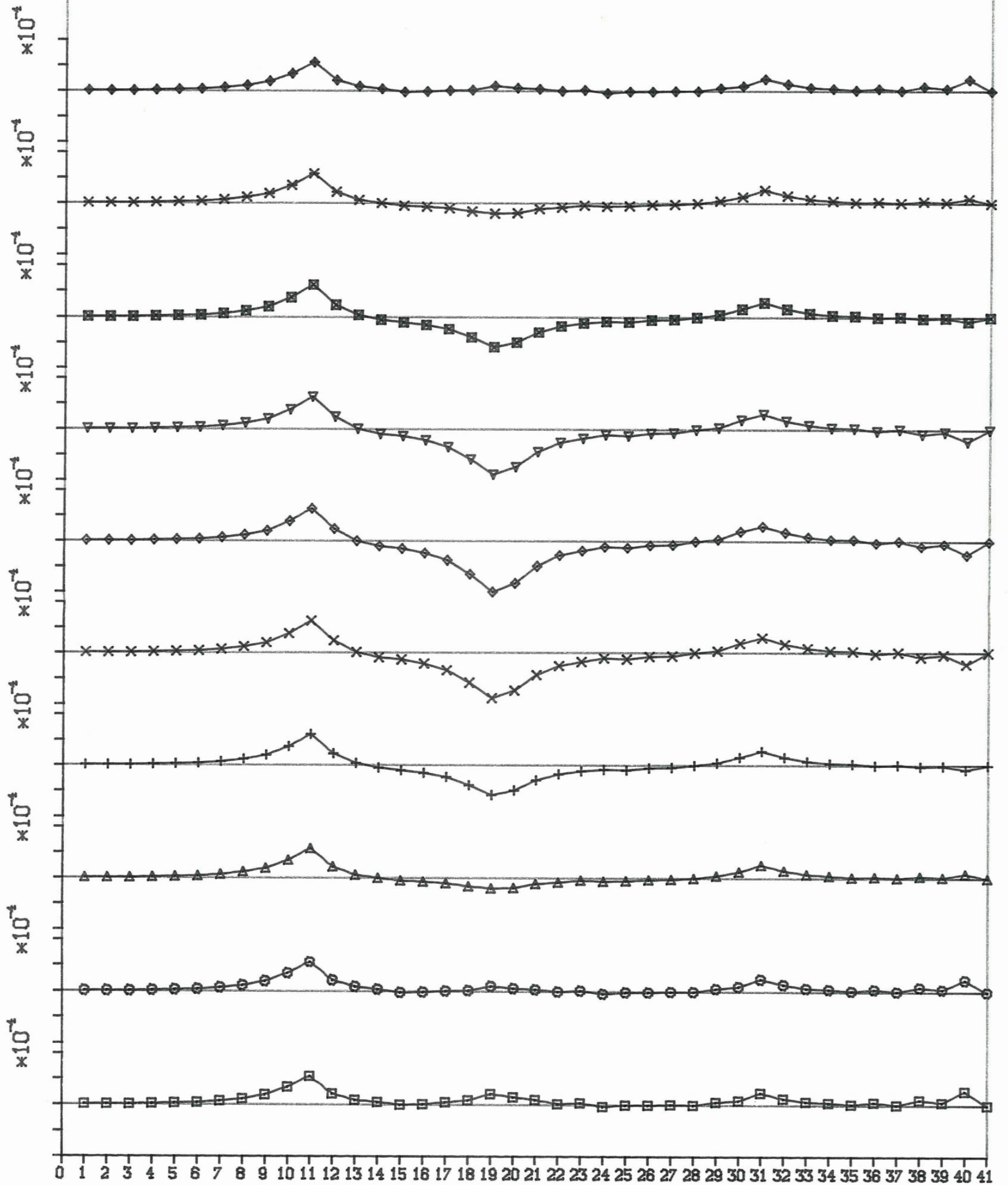
EN:TBX NPLLOT.S.NPLOT
EDITOR 31 RECORDS (VI V 132) NPLLOT.S.NPLOT
ILSV

TOP RECORD

```
0000100      DIMENSION X(41),Y(41),YARAY(10,41)
0000120      DATA X/1.0,2.0,3.0,4.0,5.0,6.0,7.0,8.0,9.0,10.0,11.,12.,13.,
0000140      114.,15.,16.,17.,18.,19.,20.,21.,22.,23.,24.,25.,26.,27.,28.,
0000160      229.,30.,31.,32.,33.,34.,35.,36.,37.,38.,39.,40.,41./
0000400      CALL BGNPL(0)
0000401      CALL NOBRDR
0000405      CALL FLATBD
0000420      CALL PAGE(10.,14.)
0000440      CALL YNONUM
0000500      CALL TITLE('COMPLIANT CURVES$',100,' ',1,0,0,9.,13.5)
0000520      CALL MESSAG('COMPLIANT SURFACE CURVES   THETA= 0,60 DEGREES$',100,
0000540      1.,12.)
0000600      CALL INTAXS
0000700      CALL GRAF(0.,1.,41.,-.001,.0005,.001)
0000800      CALL GRID(0,0)
0000900      YSHIFT=0.0
0001000      DO 12 L=1,41
0001100 12 READ(1,1)(YARAY(M,L),M=1,10)
0001200 1  FORMAT(3X,10D12.4)
0001300      DO 50 I=1,10
0001400      DO 5 J=1,41
0001500 5  Y(J)=YARAY(I,J)
0001600      CALL YGRAXS(-.001,.0005,.001,1.,' ',1,0.,0.)
0001700      CALL RLVEC(0.,0.,41.,0.,0)
0001800      CALL CURVE(X,Y,41,1)
0001900      YSHIFT=YSHIFT+1.1
0002000      CALL BSHIFT(0.,YSHIFT)
0002100 50 CONTINUE
0002200      CALL ENDPL(0)
0002300      CALL DONEPL
0002400      STOP
0002500      END
```

EUF
:E

COMPLIANT SURFACE CURVES THETA= 0,60 DEGREES



EDITOR PIE,S.PIE
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TOP RECORD

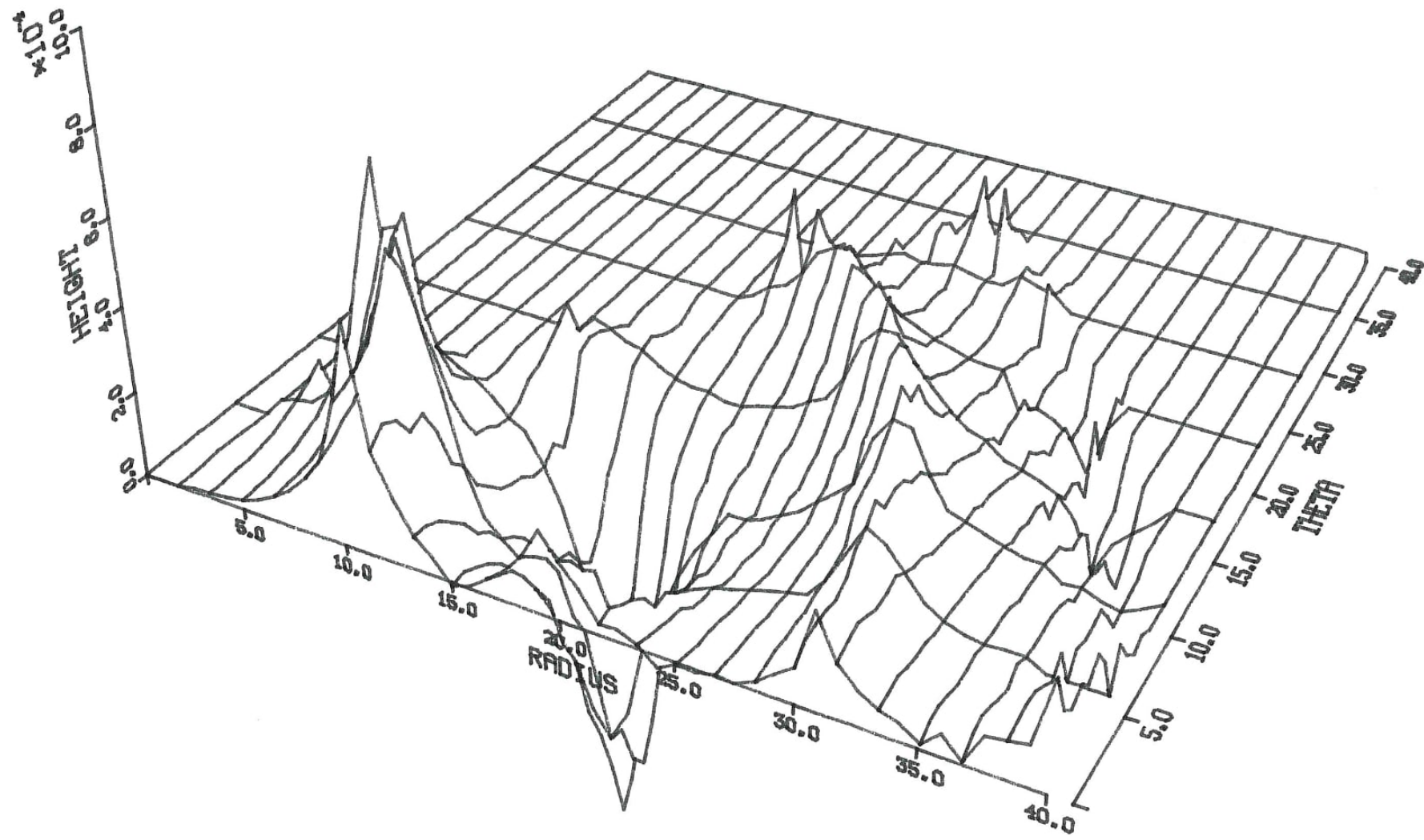
```
0000100      DIMENSION WORK(5000),ZMAT(50,50),ZARAY(10,41),XARAY(10,41)

0000120      DIMENSION YARAY(10,41)
0000200      DO 12 I=1,41
0000300      12 READ(1,1)(ZARAY(J,I),J=1,10)
0000400      1  FORMAT(3X,10D12.4)
0000500      THETA=0.0
0000520      DO 5 I=1,10
0000600      DO 6 J=1,41
0000700      XARAY(I,J)=J*COS(THETA)
0000800      6  YARAY(I,J)=J*SIN(THETA)
0000900      5  THETA=THETA+(3.14/30)
0001100      CALL BGNPL(0)
0001105      CALL PAGE(14.,10.)
0001120      CALL TITL3D('COMPLIANT SURFACE$',100,12.0,8.0)
0001200      CALL AXES3D('RADIUS$',100,'THETA$',100,'HEIGHT$',100,1.,1.,.5)
0001220      CALL VUABS(1.5,-1.5,1.5)
0001400      CALL GRAF3D(0.,5.,41.0,0.,5.,41.,0.,'SCALE',.001)
0001500      CALL BGNMAT(50,50)
0001600      CALL GETMAT(XARAY,YARAY,ZARAY,2500,WORK)
0001700      CALL ENDMAT(ZMAT,WORK)
0001800      CALL SURMAT(ZMAT,2,50,7,50,WORK)
0001900      CALL ENDPL(0)
0002000      CALL DONEPL
0002100      STOP
0002200      END
```

ECF

18

COMPLIANT SURFACE



TOP RECORD

```
000100 DIMENSION ARAY(50,50), DAT(50)
000140 REAL INITAN,MAXANG
000200 DATA MAXANG/60./, NORAD/41/, NOANG/11/, VIEW/60./
000220 DATA DATMAG/.75E4/, INITAN/0./
000225 INTEGER RADIUS,ANG
000240 PI=3.1415926
000260 K=NOANG-1
000300 DO 12 I=1,NORAD
000400 12 READ(1,1)(ARAY(J,I),J=1,K)
000500 1 FORMAT(3X,10D12.4)
000520 DO 20 J=1,NORAD
000540 20 ARAY(NOANG,J)=ARAY(1,J)
000560 INITAN=INITAN*(PI/180.)
000602 VIEW=VIEW*(PI/180.)
000603 MAXANG=MAXANG*(PI/180.)
000604 ANGINC=MAXANG/K
000606 CALL PRESS(NOANG,VIEW,INITAN,ANGINC,MAXANG)
000610 CALL BGNPL(2)
000620 CALL PAGE(10.,14.)
000624 CALL FLATBD
000630 CALL INTAXS
000640 CALL SIMPLX
000700 CALL PHYSOR(2.5,1.)
000705 CALL BLOWUP(.6)
000725 CALL XNONUM
000726 CALL YNONUM
000735 CALL XTICKS(0)
000740 CALL YTICKS(0)
000745 CALL TITLE('COMPLIANT SURFACE$',100,'$',0,'V/HEL$',100,6.,4.)
000760 CALL GRAF(0.,2.,42.,-6.,2.,22.)
000765 CALL RLMESS('R1$',100,11.,-2.)
000766 CALL RLMESS('.02$',100,1.,5.4)
000780 CALL RLVEC(0.,0.,0.,11.8,0)
000800 CALL RLMESS('-$',100,0.,5.4)
000820 CALL RLMESS('.04$',100,1.,11.3)
000840 CALL RLMESS('-$',100,0.,11.3)
000860 CALL RLMESS('R2$',100,31.,-2.)
000880 CALL DASH
000900 XTO=NORAD*COS(INITAN)
000920 YTO=NORAD*SIN(INITAN)*COS(VIEW)
000940 CALL RLVEC(0.,0.,XTO,YTO,0)
000960 CALL RLMESS('THETA=0$',100,34.,-2.)
000980 XTO=NORAD*COS(MAXANG)
001000 YTO=NORAD*SIN(MAXANG)*COS(VIEW)
001020 CALL RLVEC(0.,0.,XTO,YTO,0)
001040 CALL RLMESS('THETA=60$',100,26.,18.)
001060 CALL RESET('DASH')
001080 CALL PEN('RED')
001100 DO 14 RADIUS=1,NORAD
001120 DO 13 ANG=1,NOANG
001140 13 DAT(ANG)=ARAY(ANG,RADIUS)*DATMAG
001160 14 CALL ARC(RADIUS,VIEW,DAT,ANGINC,NOANG,INITAN)
001180 CALL PEN('BLACK')
001200 DO 16 ANG=1,NOANG,2
001220 DO 18 RADIUS=1,NORAD
001240 18 DAT(RADIUS)=ARAY(ANG,RADIUS)*DATMAG
001260 16 CALL RADIAL(ANG,VIEW,DAT,ANGINC,1,NORAD,INITAN)
001280 CALL ENDPL(2)
001300 CALL DONEPL
001400 STOP
001500 END
```

1L9>

TOP RECORD

```

0000100 SUBROUTINE PRESS(NOANG,VIEW,INITAN,ANGINC,MAXANG)
0000200 DIMENSION ARAY(50,50), DAT(50)
0000300 INTEGER RADIUS,ANG,PST,PFIN,L
0000320 REAL INITAN,MAXANG
0000400 DATA NOPTS/21/,PST/11/, PFIN/31/, L/6/
0000420 DATA PMAG/4./
0000500 DO 36 I=1,NOPTS
0000600 36 READ(2,2)(ARAY(J,I),J=1,L)
0000700 2 FORMAT(13X,6D9.4)
0000800 DO 30 I=1,L
0000820 K=(2.*L)-I
0000900 DO 31 J=1,NOPTS
0001000 31 ARAY(K,J)=ARAY(I,J)
0001100 30 CONTINUE
0001110 CALL BGNPL(1)
0001120 CALL PAGE(10.,14.)
0001130 CALL FLATBD
0001140 CALL INTAXS
0001150 CALL SIMPLX
0001200 CALL PHYSOR(2.5,7.5)
0001220 CALL BLOWUP(.6)
0001240 CALL TITLE('PRESSURE DISTRIBUTION$',100,'$',0,'PRESSURE(PGAUGE/PAT
1)$',100,6.,4.)
0001260 CALL XNONUM
0001280 CALL YNONUM
0001300 CALL XTICKS(0)
0001320 CALL YTICKS(0)
0001400 CALL GRAF(0.,2.,42.,0.,2.,28.)
0001410 CALL RLMESS('R1$',100,11.,-2.)
0001420 CALL RLMESS('R2$',100,31.,-2.)
0001430 CALL RLMESS('1$',100,1.,3.5)
0001440 CALL RLMESS('-$',100,0.,3.5)
0001442 CALL RLVEC(0.,0.,0.,8.,0)
0001450 CALL RLMESS('2$',100,1.,7.5)
0001460 CALL RLMESS('-$',100,0.,7.5)
0001500 CALL DASH
0001600 XFROM=0.*COS(INITAN)
0001700 YFROM=0.*SIN(INITAN)*COS(VIEW)
0001800 XTO=PFIN*COS(INITAN)
0001900 YTO=PFIN*SIN(INITAN)*COS(VIEW)
0002000 CALL RLVEC(XFROM,YFROM,XTO,YTO,0)
0002100 XFROM=0.*COS(MAXANG)
0002200 YFROM=0.*SIN(MAXANG)*COS(VIEW)
0002300 XTO=PFIN*COS(MAXANG)
0002400 YTO=PFIN*SIN(MAXANG)*COS(VIEW)
0002500 CALL RLVEC(XFROM,YFROM,XTO,YTO,0)
0002600 CALL RESET('DASH')
0002700 DO 32 J=1,NOPTS
0002800 RADIUS=(PST-1)+J
0002900 DO 33 ANG=1,NOANG
0003000 33 DAT(ANG)=ARAY(ANG,J)*PMAG
0003100 32 CALL ARC(RADIUS,VIEW,DAT,ANGINC,NOANG,INITAN)
0003200 DO 34 ANG=1,NOANG,2
0003300 DO 35 J=1,NOPTS
0003500 35 DAT(J)=ARAY(ANG,J)*PMAG
0003600 34 CALL RADIAL(ANG,VIEW,DAT,ANGINC,PST,NOPTS,INITAN)
0003620 CALL ENDPL(1)
0003700 RETURN
0003800 END

```

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L95

TOP RECORD

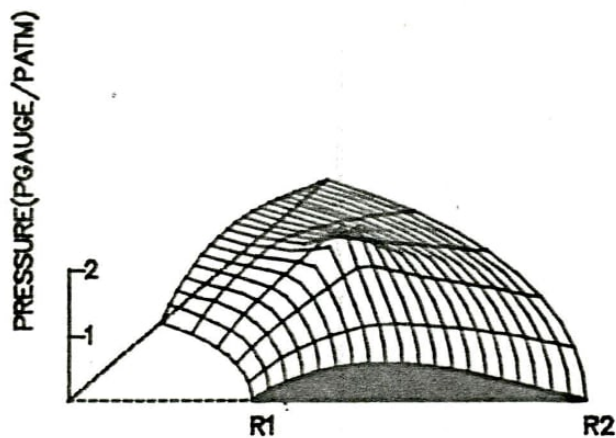
```
0000100 SUBROUTINE ARC(RADIUS,VIEW,DAT,ANGINC,NOANG,INITAN)
0000200 DIMENSION XARRAY(50),YARRAY(50),DAT(50)
0000220 INTEGER RADIUS
0000240 REAL INITAN
0000300 THETA=INITAN
0000400 DO 15 I=1,NOANG
0000500 XARRAY(I)=RADIUS*COS(THETA)
0000600 YARRAY(I)=(RADIUS*SIN(THETA)*COS(VIEW))+DAT(I)
0000700 15 THETA=THETA+ANGINC
0000800 CALL CURVE(XARRAY,YARRAY,NOANG,0)
0000900 RETURN
0001000 END
DF
```

EDITOR :Q
EDITOR CALC.S.RADIAL#F
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L99

TOP RECORD

```
0000100 SUBROUTINE RADIAL(ANG,VIEW,DAT,ANGINC,ST,NORAD,INITAN)
0000120 INTEGER R,ANG,ST,RAD
0000300 REAL INITAN
0000400 DIMENSION XARRAY(50),YARRAY(50),DAT(50),WORK(2500)
0000500 THETA=INITAN+((ANG-1)*ANGINC)
0000600 DO 17 R=1,NORAD
0000620 RAD=R+(ST-1)
0000700 XARRAY(R)=RAD*COS(THETA)
0000800 17 YARRAY(R)=(RAD*SIN(THETA)*COS(VIEW))+DAT(R)
0000900 CALL CURVE(XARRAY,YARRAY,NORAD,0)
0000920 IF (ANG .NE. 1)GOTO 19
0000940 CALL SHADE(XARRAY,YARRAY,NORAD,90.,0.01,1,WORK,2500)
001000 19 RETURN
001100 END
DF
Q
```

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COMPLIANT SURFACE

